PHYSICAL PROPERTIES OF THE SOILS
Cherokee County, Kansas

Physical Properties table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink–swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3– or 1/10–bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table,the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink–swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K<–>sat) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K<–>sat). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3– or 1/10–bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink–swell potential of soils. The shrink–swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In Physical Properties table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the Physical Properties table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine–earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to

PHYSICAL PROPERTIES OF THE SOILS--Continued
Cherokee County,
Kansas

wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and forzen soil layers also influence wind erosion.

Explanation of Wind Erodibility Groups

Soil erodibility by wind is directly related to the percentage of dry non-erodible surface soil aggregates larger than 0.84 mm in diameter. From this percentage, the wind erodibility index (I-factor) is determined. The I-factor is an expression of the stability of these soil aggregates against breakdown by tillage and abrasion from wind erosion. Soils are placed in Wind Erodibility Groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 mm as shown in the following table.

WEG	Properties of Soil Surface Layer	Dry Soil Aggregates >0.84mm Percent	Wind Erodibilty Index T/Ac/Yr (I)
1	Very fine sand, fine sand, sand, or coarse sand	1	310 1/
		2	250
		3	220
		5	180
		7	160
2	Loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, organic soil materials.	10	134
3	Very fine sandy loam, fine sandy loam, sandy loam, or coarse sandy loam.	25	86
4	Clay, silty clay, non-calcareous clay loam, or silty clay loam with >35 percent clay content.	25	86
4L	Calcareous 2/ loam, silt loam, clay loam, or silty clay loam.	25	86
5	Non-calcareous loam and silt loam with <20 percent clay content, or sandy clay loam, sandy clay, and hemic 3/ organic soil materials.	40	56
6	Non-calcareous loam and silt loam with >20 percent clay content, or non-calcareous clay loam with <35 percent clay content.	45	48
7	Silt, non-calcareous silty clay loam with >35 percent clay content and fibric 3/ organic soil material.	50	38
8	Soils not suitable for cultivation due to coarse fragments or wetness; wind erosion is not a problem.	--	0

1/ The "I" values for WEG 1 vary from 160 for coarse sands to 310 for very fine sands. Use an "I" of 220 as an average figure. For coarser sand that has gravel, use a lower figure. For a soil that has no gravel and very fine sand, use a higher figure. (Modification for coarse fragments is preparation.)

2/ Calcareous is a strongly or violently effervescent reaction to cold dilute (1N) HCL.

3/ See Soil Taxonomy for definition.

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(Single entries under "Sand and Silt" are a representative percentage are calculated using an algorithm. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	in/hr	In/in	Pct	Pct					
037ZA:														
Zaar----------	0-16	6	53	40-60	1.10-1.30	0.06-0.20	0.12-0.14	6.0-12.0	2.0-4.0	.28	.28	5	4	86
	16-38	5	52	40-60	1.10-1.50	0.06-0.20	0.11-0.18	6.0-12.0	1.0-3.0	.28	.28			
	38-53	6	48	40-60	1.20-1.50	0.06-0.20	0.11-0.18	6.0-15.0	0.5-1.0	.28	.28			
	53-60	6	46	40-60	1.20-1.50	0.06-0.20	0.11-0.18	6.0-12.0	0.0-0.8	.28	.28			
Be:														
Bates---------	0-13	45	36	10-27	1.40-1.60	0.60-2.00	0.15-0.22	0.0-2.9	1.0-4.0	.32	.32	3	5	56
	13-21	41	35	18-35	1.50-1.60	0.60-2.00	0.15-0.22	0.5-2.9	1.0-3.0	.28	.32			
	21-34	39	31	28-40	1.40-1.60	0.20-0.57	0.12-0.16	1.5-5.0	0.5-1.0	.20	.43			
	34-38			---	---	0.20-0.57	---	---	---	---	---			
Bf:														
Bates---------	0-7	50	37	15-27	1.40-1.60	0.60-2.00	0.15-0.22	0.0-2.9	1.0-4.0	.32	.32	3	5	56
	7-12	67	35	18-35	1.50-1.60	0.60-2.00	0.15-0.22	0.0-2.9	1.0-3.0	.28	.32			
	12-24	40	25	28-40	1.40-1.60	0.20-0.57	0.12-0.16	1.5-5.0	0.5-1.0	.20	.43			
	24-28			---	---	0.20-0.57	---	---	---	---	---			
Bh:														
Bates---------	0-8	50	37	15-27	1.40-1.50	0.60-2.00	0.15-0.22	0.0-2.9	1.0-4.0	.32	.32	3	5	56
	8-12	67	35	18-35	1.50-1.60	0.60-2.00	0.15-0.19	0.0-2.9	1.0-3.0	.28	.32			
	13-27	13	25	28-40	1.40-1.60	0.20-0.60	0.12-0.16	1.5-5.0	0.5-1.0	.20	.43			
	27-28			---	---	0.20-0.60	---	---	---	---	---			
Collinsville-	0-14	67	20	5-20	1.30-1.60	0.17-2.00	0.09-0.15	0.0-2.9	1.0-3.0	.20	.20	1	3	86
	14-18			---	---	0.20-2.00	---	---	---	---	---			
Bo:														
Bolivar------	0-5	59	35	4-18	1.20-1.45	2.00-6.00	0.16-0.18	0.0-2.9	0.5-2.0	.24	.24	3	3	86
	5-12	52	40	4-18	1.20-1.45	2.00-6.00	0.16-0.18	0.0-2.9	0.5-2.0	.24	.24			
	12-17	40	40	8-35	1.30-1.50	0.20-0.60	0.12-0.16	3.0-5.9	0.0-1.0	.32	.32			
	17-36	45	24	20-35	1.30-1.50	0.20-0.60	0.12-0.16	3.0-5.9	0.0-1.0	.32	.32			
	36-46			---	---	0.20-0.60	---	---	---	---	---			
	46-50			---	---	0.20-1.98	---	---	---	---	---			
Hector-------	0-3	68	24	5-20	1.30-1.60	2.00-6.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.28	1	3	86
	3-7	68	24	5-20	1.30-1.60	2.00-6.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.28			
	7-15	68	22	10-25	1.30-1.60	2.00-6.00	0.08-0.15	0.0-2.9	0.5-0.5	.17	.28			
	15-19			---	---	0.20-1.98	---	---	0.0-0.0	---	---			
Br:														
Brazilton----	0-8	14	51	28-40	1.40-1.60	0.06-0.20	0.15-0.18	3.0-5.9	1.0-4.0	.37	.37	5	7	38
	8-40	20	40	35-55	1.50-1.70	0.00-0.06	0.10-0.15	6.0-8.9	1.0-3.0	.37	.37			
	40-60	9	49	28-45	1.45-1.65	0.20-0.57	0.15-0.18	3.0-5.9	0.5-2.0	.32	.32			
Cd:														
Catoosa------	0-7	11	68	15-26	1.30-1.55	0.60-2.00	0.15-0.24	1.0-4.0	1.0-3.0	.37	.37	2	6	48
	7-12	11	68	15-26	1.30-1.55	0.60-2.00	0.15-0.24	1.0-9.0	1.0-3.0	.37	.37			
	12-28	7	60	27-39	1.45-1.70	0.20-0.57	0.15-0.22	4.0-10.0	0.5-2.0	.32	.32			
	28-32			---	---	0.00-0.60	---	---	---	---	---			
Ce:														
Cherokee-----	0-7	15	75	10-27	1.25-1.35	0.60-2.00	0.22-0.24	0.0-2.9	0.0-2.0	.49	.49	3	5	56
	7-14	12	73	10-27	1.25-1.35	0.60-2.00	0.22-0.24	0.0-2.9	0.0-2.0	.49	.49			
	14-36	5	40	40-60	1.35-1.50	0.06-0.20	0.10-0.15	6.0-14.0	0.0-1.0	.32	.32			
	36-47	7	40	40-60	1.35-1.50	0.06-0.20	0.10-0.15	6.0-13.0	0.0-1.0	.32	.32			
	47-60	9	58	30-50	1.35-1.45	0.06-0.20	0.09-0.18	2.0-8.9	0.0-1.0	.32	.32			
Ck:														
Clarksville--	0-4	18	65	14-20	1.20-1.40	2.00-6.00	0.07-0.12	0.0-2.9	0.5-2.0	.28	.37	5	8	0
	4-23	13	70	14-20	1.20-1.40	2.00-6.00	0.07-0.12	0.0-2.9	0.5-1.5	.28	.37			
	23-32	15	55	25-35	1.30-1.45	0.60-2.00	0.06-0.10	0.0-2.9	0.0-1.0	.32	.43			
	32-60	15	50	25-40	1.30-1.45	0.60-2.00	0.06-0.10	0.0-2.9	0.0-1.0	.32	.43			
Db:														
Dennis-------	0-7	18	66	10-27	1.30-1.55	0.60-2.00	0.15-0.20	0.0-5.0	1.0-3.0	.43	.43	5	6	48
	7-11	20	65	10-27	1.30-1.55	0.60-2.00	0.15-0.20	0.0-5.0	1.0-3.0	.43	.43			
	11-29	13	57	27-35	1.45-1.70	0.20-0.60	0.15-0.20	3.0-10.0	0.0-2.0	.37	.37			
	29-46	7	42	27-55	1.45-1.70	0.06-0.20	0.15-0.20	3.0-9.0	0.0-2.0	.37	.37			
	46-60	11	50	35-55	1.35-1.65	0.06-0.20	0.12-0.20	6.0-9.0	0.0-1.0	.37	.37			
Du:														
Dumps---------	---			---	---	---	---	---	---	---	---	-	---	---
En:														
Eram----------	0-11	10	52	27-40	1.30-1.60	0.06-0.20	0.15-0.20	3.0-8.9	1.0-3.0	.37	.37	3	7	38
	11-32	9	37	35-60	1.35-1.65	0.06-0.20	0.10-0.18	6.0-8.9	0.0-2.0	.37	.37			
	32-36			---	---	0.00-0.20	---	---	---	---	---			
Es:														
Eram----------	0-8	10	52	27-40	1.30-1.60	0.06-0.20	0.15-0.20	2.0-8.9	1.0-3.0	.37	.37	3	7	38
	8-26	8	38	35-55	1.35-1.65	0.06-0.20	0.12-0.18	2.0-8.9	0.0-2.0	.37	.37			
	26-30			---	---	0.00-0.20	---	---	---	---	---			
Shidler------	0-12	20	49	27-35	1.30-1.60	0.20-0.60	0.18-0.22	3.0-5.9	1.0-5.0	.32	.32	1	4L	86
	12-16			---	---	---	---	---	---	---	---			
Ge:														
Gerald-------	0-8	25	53	20-25	1.30-1.50	0.60-2.00	0.15-0.18	0.0-2.9	0.5-2.0	.43	.43	4	6	48
	8-13	25	53	20-25	1.30-1.50	0.60-2.00	0.15-0.18	0.0-2.9	0.5-2.0	.43	.43			
	13-22	8	52	35-45	1.40-1.60	0.06-0.20	0.11-0.13	6.0-8.9	0.0-2.0	.37	.37			
	22-42	18	52	25-35	1.60-1.80	0.01-0.06	0.01-0.05	0.0-2.9	0.0-1.0	.28	.43			
	42-60	6	46	35-60	1.40-1.60	0.06-0.20	0.02-0.06	3.0-5.9	0.0-0.5	.24	.37			
He:														
Hepler-------	0-7	7	79	12-27	1.25-1.35	0.60-2.00	0.22-0.24	0.0-2.9	0.5-2.0	.37	.37	5	6	48
	7-23	6	77	12-27	1.25-1.35	0.60-2.00	0.22-0.24	0.0-2.9	0.5-1.0	.37	.37			
	23-60	3	70	27-35	1.35-1.45	0.20-0.60	0.18-0.20	3.0-5.9	0.0-0.5	.37	.37			

PHYSICAL PROPERTIES OF THE SOILS--Continued
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(Single entries under "Sand and Silt" are a representative percentage are calculated using an algorithm. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	in/hr	In/in	Pct	Pct					
Hf:														
Hepler-------	0-10	7	79	12-27	1.25-1.35	0.60-2.00	0.22-0.24	0.0-2.9	0.5-1.0	.37	.37	5	6	48
	10-30	6	77	12-27	1.25-1.35	0.60-2.00	0.22-0.24	0.0-2.9	0.5-1.0	.37	.37			
	30-60	3	70	27-35	1.35-1.45	0.20-0.60	0.18-0.20	3.0-5.9	0.0-0.5	.37	.37			
Ka:														
Kanima-------	0-6	11	50	27-40	1.30-1.60	0.20-0.60	0.08-0.17	1.5-9.0	0.5-2.0	.28	.37	5	7	38
	6-60	9	56	18-40	1.40-1.70	0.60-2.00	0.02-0.12	1.5-5.0	0.0-1.0	.15	.32			
Kn:														
Kanima-------	0-6	11	50	27-40	1.30-1.60	0.20-0.60	0.08-0.17	3.0-9.0	0.5-2.0	.28	.37	5	7	38
	6-60	9	56	18-40	1.40-1.70	0.60-2.00	0.02-0.12	3.0-8.0	0.0-1.0	.15	.32			
Ln:														
Lanton-------	0-7	6	73	18-27	1.30-1.50	0.60-2.00	0.18-0.22	0.0-5.9	1.0-5.0	.37	.37	5	6	48
	7-21	6	71	18-35	1.45-1.70	0.60-2.00	0.18-0.22	2.0-5.9	1.0-3.0	.37	.37			
	21-39	4	66	30-45	1.35-1.65	0.20-0.60	0.12-0.18	2.0-5.9	0.0-1.0	.32	.32			
	39-60	4	54	30-45	1.35-1.65	0.06-0.20	0.12-0.18	3.0-5.9	0.0-1.0	.32	.32			
M-W:														
Miscellaneous Water-------	---			---	---	---	---	---	---	---	---	-	---	---
Ns:														
Nixa---------	0-5	27	54	12-25	1.30-1.50	0.60-2.00	0.10-0.16	0.0-2.9	1.0-3.0	.32	.43	3	5	56
	5-13	27	54	12-25	1.30-1.50	0.60-2.00	0.08-0.16	0.0-2.9	0.5-1.0	.32	.43			
	13-18	23	50	20-35	1.30-1.50	0.60-2.00	0.07-0.12	0.0-2.9	0.0-0.5	.32	.43			
	18-28	23	50	20-35	1.40-1.65	0.00-0.06	0.07-0.12	0.0-2.9	0.0-0.5	.32	.43			
	28-60	8	52	30-50	1.30-1.45	0.06-0.20	0.07-0.12	3.0-5.9	0.0-0.5	.32	.43			
Os:														
Osage--------	0-6	1	43	40-60	1.10-1.60	0.06-0.20	0.12-0.14	9.0-25.0	2.0-5.0	.28	.28	5	4	86
	6-17	1	41	40-60	1.20-1.60	0.00-0.06	0.12-0.14	9.0-25.0	0.8-3.0	.28	.28			
	17-60	2	35	35-75	1.20-1.60	0.00-0.06	0.08-0.12	9.0-25.0	0.5-2.0	.28	.28			
Pr:														
Parsons------	0-8	11	76	8-25	1.30-1.50	0.60-2.00	0.16-0.24	0.0-2.9	0.7-3.0	.49	.49	3	5	56
	8-14	9	69	8-25	1.30-1.50	0.60-2.00	0.16-0.24	0.0-2.9	0.7-3.0	.49	.49			
	14-31	4	31	40-75	1.40-1.70	0.01-0.06	0.10-0.18	6.0-15.0	0.2-0.8	.43	.43			
	31-60	5	52	35-60	1.40-1.70	0.06-0.20	0.10-0.18	6.0-8.9	0.2-0.8	.43	.43			
Qu:														
Quarries-----	---			---	---	---	---	---	---	---	---	-	---	---
Se:														
Secesh-------	0-10	26	54	15-25	1.10-1.30	0.60-2.00	0.16-0.20	0.0-2.9	0.0-2.0	.32	.43	4	5	56
	10-16	20	53	20-30	1.20-1.40	0.60-2.00	0.13-0.19	0.0-2.9	0.0-1.0	.32	.43			
	16-24	18	52	25-35	1.30-1.50	2.00-6.00	0.03-0.08	0.0-2.9	0.0-0.5	.24	.32			
	25-60	34	36	25-35	1.30-1.50	2.00-6.00	0.03-0.08	0.0-2.9	0.0-0.5	.24	.32			
Sf:														
Secesh-------	0-9	26	54	15-25	1.10-1.30	0.60-2.00	0.16-0.20	0.0-2.9	0.0-2.0	.32	.43	4	5	56
	9-16	20	55	20-30	1.20-1.40	0.60-2.00	0.13-0.19	0.0-2.9	0.0-1.0	.32	.43			
	16-25	34	36	25-35	1.30-1.50	2.00-6.00	0.03-0.08	0.0-2.9	0.0-0.5	.24	.32			
	25-60	34	36	25-35	1.30-1.50	2.00-6.00	0.03-0.08	0.0-2.9	0.0-0.5	.24	.32			
To:														
Taloka-------	0-8	5	78	15-25	1.30-1.50	0.60-2.00	0.16-0.24	0.0-2.9	0.5-2.0	.49	.49	4	5	56
	8-21	6	76	15-25	1.30-1.50	0.60-2.00	0.16-0.24	0.0-2.9	0.5-1.5	.49	.49			
	21-45	4	45	35-60	1.40-1.70	0.06-0.20	0.12-0.22	6.0-15.0	0.0-1.0	.43	.43			
	45-60	11	51	35-60	1.40-1.70	0.06-0.20	0.12-0.22	6.0-8.9	0.0-0.8	.43	.43			
Tt:														
Tonti--------	0-9	7	83	---	---	0.60-2.00	0.15-0.20	0.0-2.9	0.5-1.0	.43	.43	5	6	48
	9-13	7	74	---	---	0.60-2.00	0.14-0.19	0.0-2.9	0.0-1.0	.32	.43			
	13-19	7	59	---	---	0.60-2.00	0.14-0.19	0.0-4.0	0.0-1.0	.32	.43			
	19-28	7	60	---	---	0.01-0.06	0.05-0.10	0.0-2.9	0.0-1.0	.32	.37			
	28-60	16	46	---	---	0.06-0.20	0.02-0.06	0.0-2.9	0.0-0.5	.28	.37			
Vb:														
Verdigris----	0-7	13	63	15-27	1.30-1.40	0.60-2.00	0.20-0.24	0.0-2.9	2.0-4.0	.32	.32	5	6	48
	7-45	19	58	18-35	1.40-1.65	0.60-2.00	0.17-0.22	3.0-5.9	0.0-2.0	.32	.32			
	45-60	12	62	18-35	1.40-1.65	0.60-2.00	0.17-0.22	3.0-5.9	0.0-2.0	.32	.32			
W:														
Water--------	---			---	---	---	---	---	---	---	---	-	---	---
Wa:														
Waben--------	0-10	15	70	10-20	1.20-1.50	2.00-6.00	0.09-0.13	0.0-2.9	0.5-3.0	.28	.43	5	8	0
	10-18	22	53	15-35	1.20-1.50	2.00-6.00	0.05-0.13	0.0-2.9	0.0-1.0	.28	.43			
	18-60	14	51	20-45	1.30-1.60	0.60-2.00	0.05-0.15	0.0-2.9	0.0-1.0	.24	.43			
Za:														
Zaar---------	0-8	5	53	40-60	1.20-1.30	0.06-0.20	0.12-0.14	6.0-8.9	2.0-4.0	.28	.28	5	4	86
	8-15	4	53	40-60	1.20-1.30	0.06-0.20	0.12-0.14	7.0-15.0	1.5-4.0	.28	.28			
	15-36	6	49	40-60	1.35-1.50	0.06-0.20	0.11-0.18	7.0-15.0	1.0-3.0	.28	.28			
	36-60	6	46	35-50	1.35-1.50	0.06-0.20	0.10-0.18	7.0-15.0	0.0-1.0	.28	.28			